



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
WASHINGTON, D.C. 20555-0001

August 3, 2015

Mr. Timothy Timmermann
USEPA - New England, Region 1
5 Post Office Square, Suite 100
Mail Code: OSR 17-1
Boston, MA 02109-3912

**SUBJECT: NOTICE OF AVAILABILITY OF THE FINAL PLANT-SPECIFIC
SUPPLEMENT 46 TO THE GENERIC ENVIRONMENTAL IMPACT
STATEMENT FOR LICENSE RENEWAL OF NUCLEAR PLANTS REGARDING
SEABROOK STATION, UNIT 1(TAC NO. ME3959)**

Dear Mr. Timmermann:

Enclosed are two bound copies and three electronic copies of final Supplement 46 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), regarding the license renewal of Seabrook Station, Unit 1 (Seabrook).

The final Supplement 46 to NUREG-1437 will be submitted to the Environmental Protection Agency (EPA) via e-NEPA no later than August 15, 2015. In addition, a copy of final Supplement 46 is being mailed or e-mailed to interested Federal and State agencies, industry organizations, interest groups, and members of the public. A copy of this document has also been placed in the U.S. Nuclear Regulatory Commission's (NRC) Public Document Room, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, and in the NRC Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible on the NRC's website at <http://www.nrc.gov/reading-rm/adams.html>. The accession number for final Supplement 46 to NUREG-1437 is ML15209A575 for Volume 1 and ML15209A870 for Volume 2.

Additionally, enclosed are NRC's responses to EPA's recommendations that were provided by letters dated October 26, 2011 (ADAMS Accession No. ML11304A059) during the public comment period on the draft Supplement 46 to NUREG-1437, and June 28, 2013 (ADAMS Accession No. ML13189A128), during the public comment period on the Supplement to the draft Supplement 46 to NUREG-1437. These responses can also be found in Appendix A of Supplement 46.

T. Timmermann

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If further information is required, please contact Ms. Lois James, Senior Project Manager, for the review of the Seabrook license renewal application, by telephone at 301-415-3306 or by e-mail at lois.james@nrc.gov.

Sincerely,

/RA/

James G. Danna, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-443

Enclosure:
As stated

cc w/o encl: Listserv

T. Timmermann

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ADAMS Accession Nos.

1. Package: ML15187A132
2. Letter: ML15187A129
3. GEIS Supplement 46: ML15209A575

*concurrence via e-mail

OFFICE	PM:RPB2:DLR*	LA:DLR*	BC:RPB2:DLR
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DATE	7/30/15	7/9/15	8/3/15

OFFICIAL RECORD COPY

Letter to T. Timmermann from J. Danna dated August 3, 2015

SUBJECT: NOTICE OF AVAILABILITY OF THE FINAL PLANT-SPECIFIC
SUPPLEMENT 46 TO THE GENERIC ENVIRONMENTAL IMPACT
STATEMENT (GEIS) FOR LICENSE RENEWAL OF NUCLEAR PLANTS
REGARDING SEABROOK STATION, UNIT 1 (TAC NO. ME3959)

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NRC's Responses to EPA Recommendations on the Supplement 46 to the GEIS

Comment 014-01: EPA has some concern about timing of this DSEIS and licensing action being conducted so far in advance of the expiration date of the existing license. The existing license expires in 2030. Therefore, this DSEIS in support of relicensing is being prepared more than 18 years before the existing license expires. While it makes sense to start this process well in advance of the expiration date to allow for the time needed to conduct an appropriate analysis and allow for public involvement in the process, 18 years may be excessive. Such a large span of lead time poses potential problems, such as the increased chance that conditions could change in material ways that would necessitate further supplemental environmental review and revisiting of the licensing decision. There is always a risk of changed circumstances, but that risk is much greater when a review is being done so far before the action in question will take effect.

In addition, commencing the EIS process this far in advance of when the new license would go into effect calls for the public and numerous state and federal agencies to mobilize themselves and apply their limited resources to address an action that will not go into effect for more than 18 years and that, as stated above, is necessarily at greater risk of having to be revisited due to changed circumstances. Waiting to start the EIS process until the need for relicensing is closer in time may be a preferable approach. Alternatively, the NRC could explain in the Final Supplemental Environmental Impact Statement (FSEIS) why it has commenced the EIS process so far in advance of actual relicensing and its strategy for monitoring for changed circumstances that might trigger the need for further environmental review prior-to the actual relicensing.

Response: *The commenter expresses concern over the timing of SEIS development and a licensing action relative to the expiration of the current operating license for Seabrook. On May 25, 2010, as allowed by regulations at 10 CFR 54.17, NextEra submitted an application to renew the Seabrook operating license for an additional 20 years, thereby initiating the Federal action. If and when the NRC makes the determination to renew the Seabrook operating license, as stated in NRC's regulations at 10 CFR 54.31(c), the renewed license would become effective immediately and would incorporate the remainder of the current operating license, plus any additional approved time, up to a maximum of 20 additional years from the current license expiration. Since the renewed license would go into effect immediately rather than upon expiration of the existing license, the Federal action, license renewal, is occurring upon license issuance rather than in 2030. Therefore, consistent with the requirements of NEPA and NRC regulation the SEIS for license renewal is being prepared currently rather than in 2030.*

A renewed operating license is just one of a number of authorizations that a licensee must obtain in order to continue to operate its nuclear plant beyond the expiration of its current license. Many of these additional authorizations, such as EPA's NPDES permitting process, directly relate to meeting requirements designed to minimize the impact of Seabrook's operation on the surrounding environment, and must be renewed at a great enough frequency to adequately respond to changing conditions. As a result, the environmental impacts of the operation of Seabrook will continue to be analyzed and evaluated throughout the term of a renewed license.

Additionally, should the NRC approve NextEra's request for a renewed license, the NRC will continue to monitor the operation of Seabrook to ensure that it is operated in a manner that is

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consistent with the NRC's regulations designed to protect people and the environment. Should new information become available relevant to the operation of Seabrook, or its impacts on the environment, the NRC will evaluate the new information through the reactor oversight process and other NRC safety programs, such as the Generic Issues Program, to determine if any changes are needed at one or more existing plants. These processes are separate from the license renewal process.

This comment provides no new information, and no changes have been made to this SEIS as a result.

Comment 014-2: Consideration of Alternative Cooling System Designs over the Relicensing Period

The DSEIS documents meaningful entrainment impacts from the normal operation of Seabrook's cooling water system. For example, data presented in the DSEIS suggests destabilization of populations near the facility's cooling water intake structure (see, for example, the discussion at pages 4-20 and 4-34). In particular, the DSEIS explains that cumulative impacts on aquatic species would be "MODERATE for most species and LARGE for winter flounder, rainbow smelt, and other species that would be adversely affected from climate change, such as lobster and Atlantic cod." In addition, the NRC recognizes (page 8-4) "...the mounting concerns for potential adverse impacts to aquatic ecosystems from once-through cooling systems..." and suggests (page 8-14) that a new plant constructed today would likely use closed cycle cooling due to the potential for aquatic impacts. EPA shares these concerns and finds NRC's suggestion with regard to how a new plant would likely be designed to be reasonable.

While EPA understands that the NRC concludes that "...the adverse environmental impacts of license renewal for Seabrook are not great enough to deny the option of license renewal for energy planning decision makers," nevertheless, EPA regards these concerns to be significant enough to warrant careful assessment of a range of alternatives for structural and operational modifications to the Seabrook cooling system that could reduce these adverse impacts should the plant be relicensed. In addition, we recommend that the FSEIS fully discuss and evaluate the comparative environmental impacts of these alternatives. Project modifications should be framed as operational alternatives (for impact comparison purposes) and the FSEIS should characterize the relative impacts of the alternatives, such as the differing numbers of organisms to be impinged and/or entrained by the intake structure under the different alternatives. The information from the analysis should be utilized to support NRC decision-making under the criteria applicable to its licensing decision. The FSEIS should not, however, purport to provide or suggest the answers to the ultimate permitting questions that EPA must address under the Clean Water Act.

Response: *Section 4.5.4 of this SEIS has been revised to include an expanded discussion of potential mitigation options, including structural and operational modifications to the Seabrook cooling system. In addition, Chapter 8 of the SEIS has been revised to include an evaluation of a closed-cycle cooling alternative. In this analysis, the NRC staff compares the environmental impacts of the current once-through cooling system with a closed-cycle cooling system, such as the estimated impingement and entrainment rates.*

Comment 014-3: Concerns with Estimated Impacts

Due to the large cooling water demand at Seabrook Station, total entrainment and impingement loss estimates are correspondingly high. The mean entrainment losses for fish eggs are almost 1 billion per year, with maximum losses per year being more than twice that. Mean entrainment loss estimates for fish larvae are about 260 million a year, with the peak estimate being approximately 1 billion larvae per year. In addition, on average, 18×10^{12} larval bivalve are lost each year, with peak years being 3.5 times more than that.

Impingement losses varied from a low of 7,200 fish and lobsters per year to nearly 72,000 per year. The mean impingement rate of fish and lobsters is approximately 21,000 per year. Rainbow smelt is a Species of Concern for NOAA and has suffered annual impingement losses of over 1,000 fish per year, on average.

These large entrainment and impingement losses are worthy of concern on their own, but they become especially troubling when viewed in conjunction with the trawl survey results. Trawl surveys showed a statistically significant reduction in the nearfield abundance of rainbow smelt and winter flounder. The data also suggested a nearfield reduction in silver hake, but this was not statistically tested. EPA agrees with the characterization of the impact to winter flounder as large. We also think that the impact to rainbow smelt should be characterized as large, in part due to the size of the impact and the current status of the stock. Moreover, EPA concludes that the impacts to silver hake should also be rated as moderate in light of the trawl survey results presented in the DSEIS.

Response: *In its comments on the DSEIS, the U.S. Environmental Protection Agency (EPA) stated that it agrees with NRC's characterization of the impact to winter flounder as LARGE and EPA stated that the impact to rainbow smelt should be characterized as LARGE. In Section 4.5.5, NRC characterized the impact to winter flounder and rainbow smelt as LARGE.*

In its comments on the DSEIS, EPA stated that that the impacts to silver hake should be characterized as MODERATE based on trawl survey results presented in the DSEIS. In Section 4.5, NRC defined the impingement and entrainment impact as MODERATE if Seabrook monitoring data indicated that the abundance of a certain species or biological group increased at sites further from the Seabrook cooling system and remained steady near the cooling system. In addition, the NRC staff looked for a strong connection between the Seabrook cooling system and the biological group or species, such as high entrainment or impingement.

Seabrook trawl data indicated that the mean abundance of benthic silver hake near the sea floor decreased at the nearfield site and increased at the farfield sites. However, the decrease in abundance was relatively small and whereby the range of variability overlapped between the preoperational and operational monitoring periods at the nearfield, as shown in Table 4.5-9. Specifically, the 95 percent confidence interval overlapped between the preoperational and operational data. NAI (2010) did not test whether the trends for silver hake were statistically significant. Gill net monitoring data indicated that the abundance of pelagic silver hake within the water column increased at the nearfield sites and increased or remained similar at the farfield sites. Similarly, ichthyoplankton monitoring data indicated that the abundance of silver hake eggs and larvae increased at both nearfield and farfield sampling sites.

Because of the high variability from the trawl surveys and the consistent change in abundance at the nearfield and farfield sites found during the ichthyoplankton studies and the gill net monitoring, NRC staff determined that the monitoring results for silver hake did not fit the definition of a MODERATE impact as defined in Section 4.5 of this SEIS. No change was made based on this comment.

Comment 014-4: Need for Expanded Monitoring Program

The monitoring program that has been in place through the NPDES program has provided a useful long-term record of conditions offshore. The trawl program has now detected an impact for several fish species in the nearfield stations. Due to the limited number of trawl stations, however, the geographic scope of this impact cannot be characterized with a high level of confidence. In light of the recent results, EPA believes that an expansion of the geographic coverage of the trawl program is in order to better characterize the full scope of the impacts. We look forward to discussing expansion of this effort at the federal-state interagency review meetings to discuss biological monitoring data anticipated to occur in December 2011.

Response: *The NRC acknowledges the EPA's intention to discuss the potential need for expanded monitoring around Seabrook with NextEra. No change was made based on this comment.*

Comment 014-5: Comparison with Other Facilities' Entrainment and Impingement (pages 4-16 to 4-19)

The DSEIS compares entrainment and impingement losses between Seabrook and the Pilgrim Nuclear Power Station in Plymouth, MA (Pilgrim), in an effort to characterize the scale of the impacts. EPA believes that it is inappropriate to draw conclusions on the scale of impact at one facility by simply comparing its entrainment and impingement numbers with those of another facility. The specific circumstances of each receiving water and species involved must be taken into account. In other words, each facility must be evaluated individually in light of its ecological context. For example, entrainment and impingement losses caused by the Brayton Point Station power plant in Somerset, MA, were very large, but were lower on an absolute basis than the losses at either Pilgrim or Seabrook. The losses at Brayton Point Station were regarded to be very serious because of their contribution to a baywide decline in fish populations. Losses at Seabrook need to be evaluated in light of their environmental context. (EPA also notes that it does not necessarily concur with the characterization of the losses at Pilgrim presented in the DSEIS.)

Response: *In its comment on the DSEIS, EPA stated that it is "inappropriate to draw conclusions on the scale of impact at one facility by simply comparing its entrainment and impingement numbers with those of another facility. The specific circumstances of each receiving water and species involved must be taken into account." For the aquatic resources impact assessment, a comparison of the impingement rates, entrainment rates, and overall conclusions between Pilgrim and Seabrook was a small part of five lines of evidence that the NRC staff considered to assess the impacts from Seabrook. The NRC staff presented this information in the SEIS because both plants are in the same region of the United States, many of the same fish species are impinged and entrained at both plants, and because in 2002, EPA*

conducted a case study analysis for a proposed Section 316(b) Phase II existing facilities rule that evaluated the economic losses associated with impingement and entrainment at both Seabrook and Pilgrim. In addition to this comparison, the NRC staff's assessment took into account the specific circumstances near Seabrook, as suggested by the commenter. For example, the assessment considered the relative impingement and entrainment rates among the species found near Seabrook, the commonality of the impinged and entrained species, as well as the abundance trends near the intake and discharge structures and areas approximately 3–4 nautical mi (5–8 km) from the intake and discharge structures. Thus, the assessment not only considers the absolute losses from entrainment and impingement, but also the relative impact to the population near Seabrook. No change was made based on this comment.

Comment 014-6: Groundwater Contamination

Background

Radionuclide contamination of groundwater at the Seabrook site is a concern. Since a leak was detected in the spent fuel pool water in 1999, Seabrook has undertaken efforts eliminate the leak and to monitor and actively contain tritium-contaminated groundwater. Although there are no known drinking water supplies downgradient of the site and no drinking water supplies appear to be threatened by tritium-contaminated groundwater, the continued detection of elevated tritium in groundwater requires vigilance. Based on our review of the DSEIS, it is unclear whether groundwater monitoring and containment activities performed at the site are performed on a voluntary basis or are subject to regulatory or public oversight.

Comments/Recommendations

Due to the history of radionuclide contamination of groundwater at this site (and others around the country), we offer the following comments and recommendations:

- Seabrook's efforts related to groundwater contamination should be reported publicly and subject to review by appropriate regulators. Information related to groundwater tritium contamination should be made easily accessible by the public. The Vermont Department of Health's website on tritium contamination at Vermont Yankee provides a useful example of how data can be made accessible to the public (<http://healthvermont.osov/enviro/rad/vankee/tritium.aspx>).
- We recommend license renewal permit conditions that require groundwater monitoring and reporting to ensure that groundwater contamination is appropriately characterized and controlled. Groundwater monitoring and management should be part of a welldefined, long-term, comprehensive strategy. Periodic reviews of the overall strategy and the data and reports generated should be conducted in coordination with Seabrook and NRC officials.
- Groundwater sampling for other contaminants of concern (e.g. metals) should also be conducted to ensure that the full extent of contamination has been characterized. Groundwater analytes should not be limited to tritium, but should also include additional contaminants that are present in spent fuel pool water, the source of the leak. For example, Cesium 137 and Strontium 90 are potential additional contaminants to be monitored. In order to obtain a representative sample, unfiltered, "low flow" sampling should be employed.
- Management and monitoring of groundwater should be conducted in accordance with the recommendations contained in NRC's Groundwater Task Force Final Report, June 2010 (<http://www.reeulations.gov/#!documentDetail:D=NRC-2010-0302-0002>).

Response: This comment expresses concern about the availability of information on groundwater contamination relative to Seabrook and its adequacy, the need for license conditions related to groundwater monitoring and reporting, and implementation of NRC's Groundwater Task Force Final Report. As described in the NRC staff's response to comment 011-6, Section 2.2.5 of this SEIS summarizes the state of knowledge related to historical radionuclide releases to groundwater beneath the site, and Section 4.10 of this SEIS presents the NRC staff's evaluation of the impacts of inadvertent releases of tritium with respect to groundwater quality and human health. Sections 2.2.5 and 4.10 of this SEIS have been updated to reflect the latest groundwater monitoring results for Seabrook, which are documented in annual radioactive effluent release reports submitted to the NRC. These reports are publicly available, along with additional information on radiological monitoring conducted at Seabrook, at <http://www.nrc.gov/reactors/operating/ops-experience/tritium/plant-specific-reports/seab1.html>. These radioactive effluent release reports are required to be submitted to NRC by 10 CFR 50.36a. The regulation requires nuclear power plants to annually submit a report that lists the types and quantities of radioactive effluents released into the environment as a requirement of each nuclear power plant's operating license. Further, as described in Section 4.8 of this SEIS, NextEra conducts a Radiological Environmental Monitoring Program (REMP) to assess the radiological impact, if any, to its employees, the public, and the environment from the operations at Seabrook. The REMP measures the aquatic, terrestrial, and atmospheric environment for radioactivity, as well as the ambient radiation. In addition, the REMP measures background radiation (i.e., cosmic sources, global fallout, and naturally occurring radioactive material, including radon). The REMP supplements the radioactive effluent monitoring program by verifying that any measurable concentrations of radioactive materials and levels of radiation in the environment are not higher than those calculated using the radioactive effluent release measurements and transport models. Section 4.8 of this SEIS contains the staff's review of the latest radioactive effluent and REMP reports for Seabrook. The NRC's ongoing Inspection Program periodically inspects NextEra's radioactive effluent monitoring and REMP programs for compliance with NRC's radiation protection standards in 10 CFR Part 20. The NRC's Reactor Oversight Program (ROP) evaluates the data for compliance with radiation protection standards (Inspection Procedure (IP) 711124.08). If the data were to show a non compliance with requirements, the NRC would take appropriate enforcement action. As also noted in Section 2.2.5 of the SEIS, NextEra has separately implemented a groundwater monitoring program as part of its participation in the Nuclear Energy Institute's Groundwater Protection Initiative (NEI 2007) to ensure timely detection and effective response to situations involving inadvertent radiological releases to groundwater, from whatever the source, and to enhance licensee communications with their stakeholders about these situations. The early detection of contamination, typically through on-site monitoring wells, allows licensees to take actions as necessary to prevent the off-site migration of licensed radioactive material. The NRC does review licensees' implementation of the industry-wide Ground Water Protection Initiative as part of its radiation protection program oversight. However, the program itself is not an NRC-required program and the guidance in the document is not subject to regulatory enforcement.

As also cited by the commenter, NRC has taken proactive steps to implement many of the recommendations outlined in the June 2010 Groundwater Task Force Final Report (NRC 2010b). Immediately upon publication, NRC's Executive Director for Operations appointed a senior management review group to evaluate the Final Report and to assess the 16 conclusions and 4 recommendations identified in the report by the Groundwater Task Force

(ADAMS Accession Number ML101680435). In February 2011, NRC's Executive Director of Operations presented an information paper to the Commission detailing the review group's findings and initiatives to address two of the four themes presented in the Groundwater Task Force Final Report (ADAMS Accession Number ML110050252). This paper outlines the near term actions taken and longer term actions that are proposed or ongoing. They include initiatives to strengthen public trust and ensure greater reliability and consistency of the NRC's response to leakage of radioactive effluents or potential contamination of groundwater through better communication with the States, the public, and other stakeholders. A separate Commission information paper (SECY-11-0019, ADAMS Accession Number ML110050525) was also submitted that describes the staff regulatory approach for addressing groundwater protection and the themes of reassessing the regulatory framework and maintaining barriers as designed to confine licensed material. Subsequently, in August 2011, the Commission issued a staff requirements memorandum (SRM-SECY-11-0019, ADAMS Accession Number ML112270292) approving of the senior management review group's approach, including the recommendation not to incorporate the voluntary industry initiative on groundwater protection into the NRC's regulatory framework.

This comment provides no new information, and no changes have been made to this SEIS as a result.

Comment 014-7: Comment Related to the Combination Alternative of Natural-Gas-Fired Combined-Cycle and Wind Alternative

Section 8.3 of the DSEIS analyzes the Combination Alternative of Natural-Gas-Fired Combined-Cycle and Wind as a means to replace the baseload power of Seabrook Station. This framework can work conceptually when just "truing up" the annual output of a small gas plant and a series of wind farms, but we believe it would be challenging to achieve full replacement as described in the DSEIS, particularly when the gas plant is sized for only half of the output of Seabrook. The discussion does not fully address how baseload power plants work - which is to provide a steady, daily, consistent source of power. While the DSEIS presents a range of sizes and locations of wind farms to help address the variability of wind speed and duration, there are still likely to be times when the output from the wind farms is less than their share of the amount of power produced daily by a baseload power plant. Therefore, we believe periodic gaps in output from the wind farm arrays would be more realistically addressed through a combination alternative gas plant sized for more than just half of the total output.

Response: *The intermittency of wind energy is discussed in Section 8.3 of this SEIS. This discussion includes the basis for why it is reasonable to assume that wind farms, paired with an NGCC plant, could provide replacement, baseload power for Seabrook. For example, the analysis assumes that there would be five onshore and offshore wind farms separated geographically. The five wind farms would be interconnected and operate in concert with one another as a "virtual power plant", reducing the probability that all of the wind farms would experience the same unproductive wind conditions simultaneously. Introducing an off-shore wind farm further reduces the potential for intermittent wind power generation because wind profiles in offshore locations are expected to be relatively constant throughout a diurnal cycle. The NRC acknowledges that, should an alternative such as the one described in Section 8.3 be implemented, the capacity of the NGCC plant may need to be adjusted based on actual conditions at the time of implementation. However, the NRC staff believe that the impacts*

resulting from such a change would not be large enough to change the conclusions reached in the SEIS.

No changes have been made to this SEIS as a result of this comment.

Comment 038-1: EPA reviewed and commented on the DSEIS in 2011. Our detailed comments focused on a number of environmental issues including the effects of the facility's cooling system on the environment from water withdrawals and discharges and ways to avoid, reduce, and mitigate those impacts. Our comments also recommended a more complete consideration of alternative plant cooling system scenarios for the relicensing period and recommended that the EIS address other operational impacts, including the entrainment and impingement of fish and other aquatic organisms, and releases of tritium to groundwater.

We reviewed new information regarding tritium releases contained in the supplement and note that our DSEIS comments on groundwater remain unchanged. Those comments suggested that information related to groundwater tritium contamination at Seabrook should be made easily accessible to the public. In response to the recent supplement, we re-emphasize that need. Although the supplement states that monitoring results are reported to the NRC, monitoring results should also be reported directly to the public, for example, through a dedicated website such as that used by Vermont Yankee and the VT Department of Health for tritium contamination at the Vermont Yankee site. Reporting this information publicly will ensure improved transparency on groundwater contamination issues and facilitate reviews of actions taken to monitor and contain contaminated groundwater.

Response: *This comment concerns comments submitted by the EPA on the August 2011 draft SEIS. The purpose of the supplement to the draft SEIS, which was published in May 2013, was to consider new information that became known after the issuance of the August 2011 draft SEIS: NextEra's revised SAMA analysis and new and revised Category 1 and 2 issues resulting from the publication of the final rule (78 FR 37282, June 20, 2013) revising 10 CFR Part 51. The 2011 U.S. EPA comments are addressed in this final SEIS. Specific responses to U.S. EPA comments on the 2011 draft SEIS can be found in Appendix A, Section A.2, "Comments Received on the Draft SEIS."*